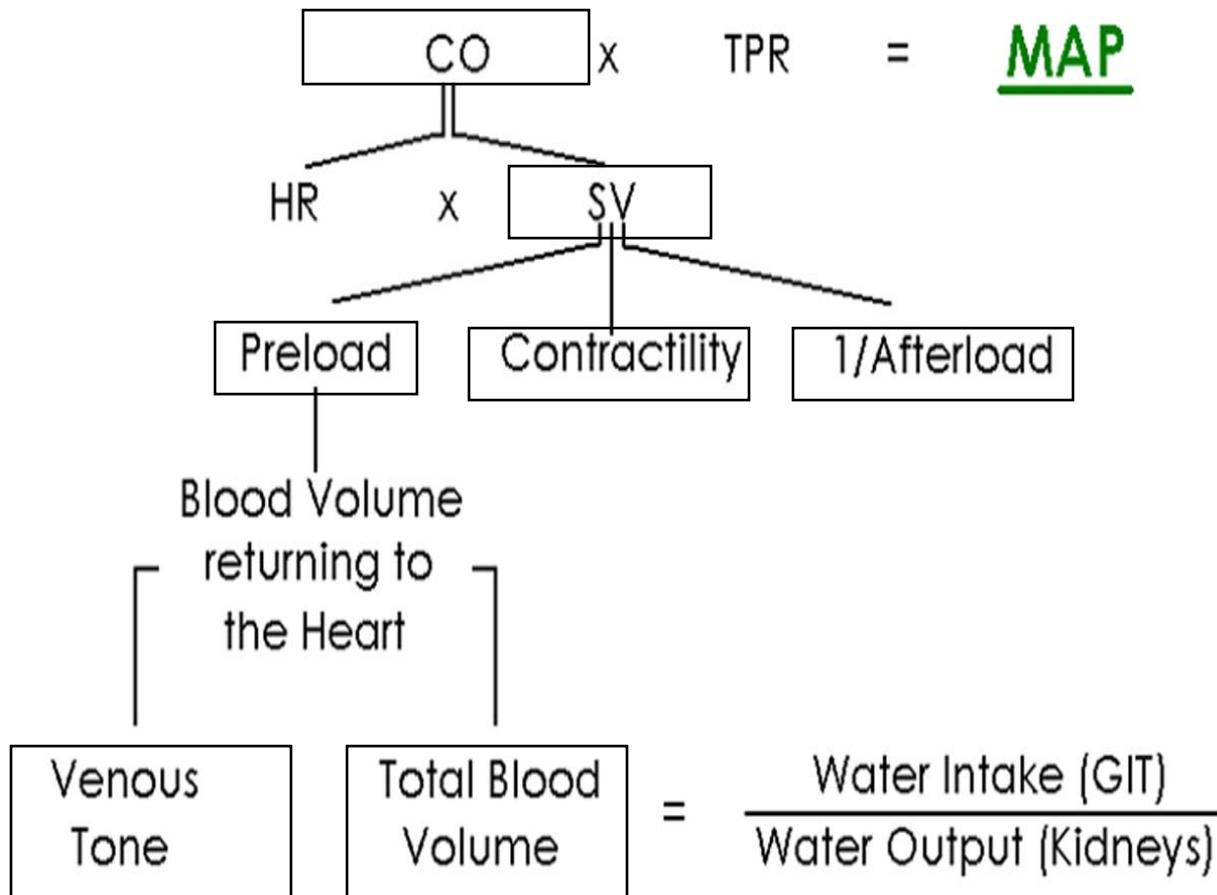


Syncope- Facilitator Copy
AHD 7/30/15

While you are waiting for AHD to begin please fill out the below diagram to the best of your ability.



Case 1:

27 year old woman is brought to the ER after passing out during her wedding ceremony. She had been standing on the altar for 20 minutes when she began to feel warm, nauseated and flushed. She remembers the room turning gray and then awoke on the floor. Witnesses noted complete loss of consciousness, diaphoresis and clonic jerking of her arms. There was no injury, tongue biting or incontinence. She had recovered within 1 minute of the event. She denied chest pain, SOB and palpitations during or prior to the event.

Past Medical History: None

Family History: DM2, no sudden death

Medications: none

1. What are the salient points from this history?

- **Age (27yo):** Means she is likely healthy
- **Activity/ Position:** Standing for 20 minutes
- **Prodrome : Warm, nauseated & flushed:** suggest increase parasympathetic tone associated with vasovagal syncope
- **Room turning gray with LOC:** true syncope
- **No injury, tongue biting or incontinence:** points away from seizure
- **Recovered in 1 minute:** Rapid or Transient recovery may suggest vasovagal or arrhythmia
- **Associated symptoms:** Denies CP/ SOB/ Palpitations - Less likely to be caused by cardiac
- **Clonic jerks:** occurring after fall, likely vasovagal; before fall – seizure

Refer to the likelihood ratios attached to the facilitator guide!

What's a likelihood ratio? The likelihood ratio for a positive result (LR+) tells you how much the odds of the disease increase when a test is positive.

How do we calculate it? $+LR = \text{Sensitivity} / (1-\text{specificity})$ $-LR = (1-\text{sensitivity})/\text{specificity}$

Math checks out in the table provided

2. What information do you want at this point (exam or otherwise)? Why?

- **Vitals and PE: Focusing on Cardiac, Neuro**
- **Orthostatic vitals**
- **EKG**

Discuss appropriate initial work-up for syncope. Make sure to discuss that because there are no risk factors for cardiogenic etiology, there is no need for additional work-up beyond exam and ECG if it is the first episode.

This is provided to the residents/students on their copy:

Physical Exam:

VS: T 98.6, BP 132/80 in both arms without orthostatic changes, P 60, SaO₂ 100%

Gen: Well appearing

HEENT: MMM, PERRL, No JVD

CV: RRR, no murmurs, rubs or gallop, PMI normal

Resp: CTAB, no wheezes, crackles or rhonchi

ECG: Normal Sinus Rhythm

3. What is her diagnosis? What factors support your diagnosis?

- **Reflexive Syncope, her form is known as Vasovagal syncope**

4. What is the pathogenesis of her syncope?

- INAPPROPRIATE increase in parasympathetic tone causing venodilation and bradycardia.
- Prolonged standing -> venous pooling -> decreased venous return & decrease LV filling -> NORMALLY should cause increased sympathetic tone & contractility of LV. IN VASOVAGAL - LV receptors misinterpret the signal as volume overload (b/c increase contractility of heart) and signal to increase parasympathetic tone, this is an ABNORMAL response
- Reflexive syncope is due to an ABNORMAL increase in parasympathetic stimulus

5. What is your treatment plan? Admit/Discharge? Follow-up? Additional Studies? Should she drive?

Discharge, return to clinic if they have additional episodes.

Patient counseling:

- Avoid triggers
- Physical counter-pressure maneuvers (IIa)
 - Need long prodrome to get into position
 - Lie supine
 - Cross legs
 - Do isometric contractions of legs
 - Do isometric contractions of arms and hands

- ✖ Grip hands and pull apart

- Increases systolic BP (10%) and CO

Driving ACC/AHA/HRS 2017 suggestions

- 1–6 VVS episodes/year: 1 month suspension
- >6 VVS episodes/year: not fit to drive until resolution of symptoms

6. She returns to your office after 2 more episodes in 3 months. What now? What about driving?

- Holter monitor
- Tilt-table: Useful for those with structurally normal hearts. Uses changes in positioning to reproduce the symptoms of vasovagal syncope.
 - If Tilt-table produce LOC without CV effects (bradycardia, hypotension) it may be suggestive of Psychiatric etiology (esp anxiety, depression, conversion d/o)
 - Indicated for single unexplained episode in high risk situation, or recurrent with no heart disease, or in those with heart disease after cardiac causes ruled out.
- Psych eval: Diagnosis of exclusion.
 - Random Interesting Info: A few studies evaluated the usefulness of a hyperventilation maneuver in syncope – open mouth hyperventilation x 2-3 minutes and presyncope/ syncope. Found correlation btwn + result and patients with psychiatric cause of syncope

Case 2: 72 year old man is brought to the ER after passing out at home. He had been using a sledge hammer to remove a fence post. He remembers swinging the hammer several times and awoke on the ground. A witness noted complete loss of consciousness. There was no injury, tongue biting or incontinence. He had recovered within 1 minute of the event. He denied chest pain, SOB but has had palpitations frequently over the past year.

Past Medical History: STEMI, Systolic HF 35%

Medications: Lisinopril 20mg qday, Carvedilol 12.5mg bid, ASA 81mg daily, Simvastatin 40mg qday

1. What are the salient points of Case 2? Why?

- a. Specifically compared to Case 1 what are components to this history that are more concerning.
- Age (72yo): increased risk of aortic stenosis, can result in decrease cardiac output by having outflow obstruction
- Activity prior (Swinging the hammer): Exertional, concern for cardiac
- Awoke on the ground: No prodrome, so likely not vasovagal
- LOC: True syncope
- No injury, tongue biting, incontinence: point away from seizure
- 1 minute recovery time: rapid recovery, can occur in vasovagal & arrhythmia
- Associated symptoms - Palpitations: concerning for arrhythmia
- PMHx: STEMI, CHF: Underlying heart disease = increased risk for syncope either arrhythmia or ischemia

- **Meds: Carvedilol: Can cause bradycardia and subsequent syncope**

Have them discuss the odds ratios toward the back of the preceptor packet for cardiovascular issues! What would they expected from then sign/symptom. What was the actual odds ratio?

2. What information do you want at this point (exam or otherwise)? How is your work-up for this patient different from Case 1 and why?
 - **Vitals and PE: Focusing on Cardiac, Neuro**
 - **Orthostatic vitals**
 - **EKG**
 - **Echo**

This patient has several risk factors for cardiogenic syncope, will need more work-up than just history, exam and ECG.

Physical Exam

VS: T 98.6, BP 132/80 in both arms without orthostatic changes, HR 60, RR 16, SaO₂ 100%

Gen: Well, NAD

HEENT: MMM, PERRL, no increased JVP

CV: RRR, no murmur or rubs but an S3 is present. PMI is enlarged

Resp: CTAB, no wheezes, crackles or rhonchi appreciated

ECG: Normal Sinus Rhythm with an old LBBB

3. What is his likely diagnosis?
 - **Cardiogenic Syncope- Arrhythmia vs. Structural (inability to increase CO with exertion)**
4. What is the pathogenesis of his syncope?
 - **Decrease in cardiac output either due to stroke volume (obstruction) or heart rate (arrhythmia)**
 - **Abnormal conduction system due to cardiac disease – examples**
 - **Abnormal Cardiac Output**
5. What are your next steps? Admit/Discharge? Additional studies? Follow-up?
 - **Admit to floor**
 - **Echocardiogram**
 - **Continuous telemetry**
 - **Consider potential need for stress test vs troponins**
 - **Will likely need Cardiology follow-up dependent on the above studies**

Case 3: 72 year old Caucasian man is brought to the ER after passing out at home. He had been sitting in his chair watching The Price Is Right and upon rising he passed out. There was no injury, tongue biting or incontinence. He had recovered within 1 minute of the event. He denied chest pain, SOB and palpitations.

Past Medical History: HTN, Atrial fibrillation, depression and BPH

Medications: Sertraline 50mg qday, Atenolol 100mg qday, HCTZ 25mg qday, Digoxin 0.125 mcg qday, Warfarin 5mg qday, Doxazosin 4mg qday

You perform a focused physical exam, obtain orthostatic blood pressures and an ECG

Physical Exam:

Vital Signs:

T: 98.6, BP 132/80 in both arm, drops to 90/60 with standing, P: 60, RR: 16, SaO₂:100%RA

Gen: NAD

HEENT: Dry MM, No increased JVP

CV: RRR, no murmur, rub or S3. PMI is normal

Resp: CTAB, normal work of breathing

ECG: Normal sinus rhythm

1. What are the salient points in this case? Based on his history and exam what is his diagnosis?
 - a. **Age (72yo): increased risk of cardiogenic etiology but also more sensitive to medications he is taking**
 - b. **Activity/ Position: sitting to standing**
 - c. **Passed out: true syncope**
 - d. **Exam with positive orthostats**
 - e. **Associated symptoms: Denies CP/ SOB/ Palpitations**
 - f. **PMHx: A-fib – at risk for arrhythmia**
 - g. **Meds: Sertraline (arrhythmia), Atenolol (brady) , HCTZ (dehydration), digoxin (arrhythmia), Warfarin (bleeding out), Doxazosin (alpha antagonist; postural dizziness, arrhythmia)**

Diagnosis: Orthostatic Syncope

2. What is the pathogenesis of his syncope?

A rapid decrease in venous return to the heart, ensuing reduction in ventricular filling results in diminished cardiac output and blood pressure, fall in blood pressure and thoracic volume provokes a compensatory reflex involving the central and peripheral nervous systems that results in an APPROPRIATE increase in sympathetic response and reduction in parasympathetic response (ie, baroreceptor reflex). The increase in

sympathetic outflow raises peripheral vascular resistance, venous return, heart rate and cardiac output, thereby limiting the fall in blood pressure.

- a. **Volume depletion, Medications, Autonomic Insufficiency – all can impair this normal response**
 - i. **Discuss what medications place this patient at risk**
 - ii. **Also discuss causes of autonomic dysfunction (DM2, Amyloid, peripheral neuropathies)**
3. What are your next steps? Admit? Follow-up? Additional work-up?
- **2 options, stop his diuretic and hydrate the patient in the ED if patient is no longer symptomatic can be discharged home with close follow-up. 2nd option is to admit and make changes to medications while admitted. Discuss personal cases and what you have done.**
4. Based on JNC-8 guidelines what are this patient's blood pressure goals? What anti-hypertensive classes are recommended as first line for him? Finally, in the setting of his orthostatic hypotension which class would you select? (Hint: He is not diabetic and does not have proteinuria or CKD)
- **Goal <150/<90**
 - **Class Agents: Calcium Channel Blockers, Ace Inhibitor/ARB, or Thiazide**
 - **Discuss how a diuretic is the wrong option for this patient b/c of his orthostats and CCB can decrease heart rate. So ACEi may be the best option for this person, if BP becomes >150/>90**

Case 4

52 year old man is brought to the ER after passing out at home. He had been sitting in his chair watching The Price Is Right, began feeling queasy, nauseated, diaphoretic and slowly grayed out. There was no injury, tongue biting or incontinence. He had recovered within 1 minute of the event. He denied chest pain, SOB and palpitations.

Past Medical History: None

Medications: Aleve bid for a "bad knee"

Physical Exam:

VS: T 98.6, BP 132/80 in both arms and drops to 90/60 with standing, P 115, RR 16, SaO₂ 100%RA

Gen: NAD

HEENT: MMM, PERRL, no increased JVP

CV: RRR, no murmur, rub or gallops. PMI is normal

Resp: CTAB, no wheezes, crackles or rhonchi

GI: Soft, mild tenderness to palpation in mid-epigastric, black sticky stool

ECG: Sinus tachycardia

H/H: 11.6/34

Bun/Cr: 34/1.1

1. What type of syncope does he have?

Orthostatic Syncope

2. What is his likely diagnosis?

GI Bleed, causing an acute blood loss anemia

3. What are your next steps? Admit? What are your initial orders?

- **Admit to Stepdown or ICU**
- **Place 2 large bore IVs**
- **Start PPI gtt**
- **Make sure patient is Type and Screened**
- **Consult GI**

Case 5

52 year old man is brought to the ER after passing out at home. He had been sitting in his chair watching The Price Is Right, began to cough, saw stars and blacked out. There was no injury, tongue biting or incontinence. He had recovered within 1 minute of the event. He denied chest pain, has chronic SOB and no palpitations.

Past Medical History: COPD (FEV1= 0.80, 40%)

Medications: Symbicort 2 puffs bid, Spiriva 2 puffs daily and albuterol prn, oxygen 2L nasal cannula

Physical Exam:

VS: T 98.6, BP 132/80 in both arms with orthostatic changes, no pulsus paradoxus, P 100, RR 24, SaO2 94% on 2L

Gen: Thin

HEENT: MMM, PERRL, minimally increase JVP

CV: RRR, no murmur, rubs or gallops. PMI is subxiphoid

Resp: Breath sounds are decreased bilaterally

ECG: Normal sinus rhythm, Right axis and right atrial enlargement

1. What type of syncope is this? Identify the key features of this patient's history and exam that brings you to this decision.

- **Reflexive Syncope**

- Key features
 - Age: Not that helpful
 - Activity: Coughing > increase intrathoracic pressure -> decrease venous return -> decr CO -> dec cerebral perfusion
 - Also may have vagal stimulation -> brady
 - Prodrome: Saw stars – not helpful
 - Recovery time: 1 minute – rapid
 - Associated symptoms: No CP, palpitations – suggest non cardiac
 - PMHx: COPD – Increased risk of Pulm Htn with also places pt at increased risk for syncopal episode due to decrease CO with RHF

2. What is the pathogenesis of this syncope?

- Coughing > increase intrathoracic pressure -> increase JVD -> Inc venous pressure -> Decrease Cerebral Perfusion Pressure (worsened by Pulm HTN from COPD)
- Vagal stimulation with cough

3. What are your next steps? Admit? Follow-up? Additional Studies?

- Generally no initial intervention for situational syncope alone, but for someone with signs of Pulm HTN, we will need to investigate and manage those conditions.
- PFTs
- Echo; +/- RHC
- Manage COPD & Pulm HTN

Table 1. Comparison of the Most Significant Historic Features in Patients With Seizures and Established Diagnoses of Syncope

	Sensitivity	Specificity	Likelihood Ratio	p Value (Chi-Square)
	Factors Most Strongly Predictive of Seizures			
Cut tongue	0.451	0.973	16.460	< 0.001
Head turning	0.431	0.968	13.481	< 0.001
Unusual posturing	0.353	0.973	12.880	< 0.001
Bedwetting	0.235	0.964	6.447	< 0.001
Blue color observed by bystanders	0.326	0.944	5.813	< 0.001
Limb jerking noted by others	0.686	0.877	5.566	< 0.001
Prodromal trembling	0.294	0.941	4.951	< 0.001
Prodromal preoccupation	0.078	0.982	4.284	0.002
Prodromal hallucinations	0.078	0.982	4.284	0.002
Behaviors not recalled	0.529	0.868	3.998	< 0.001
Loss of consciousness associated with stress	0.569	0.849	3.773	< 0.001
Muscle pain	0.157	0.954	3.433	0.004
Prodromal déjà vu	0.137	0.959	3.341	0.009
Observed unresponsiveness	0.765	0.749	3.045	< 0.001
Postictal confusion	0.941	0.690	3.031	< 0.001
Postictal headaches	0.490	0.836	2.982	< 0.001
Prodromal mood changes	0.235	0.918	2.863	0.002
Abnormal behaviors* noted by bystanders	0.922	0.671	2.803	< 0.001
Factors Most Strongly Predictive Against Seizures				
Presyncope spells before loss of consciousness	0.275	0.274	0.378	< 0.001
Self-reported high blood pressure	0.098	0.690	0.316	0.002
Presyncope with hot/warm environments	0.078	0.731	0.291	0.004
Presyncope with needle	0.039	0.863	0.286	0.052
Prodromal vertigo	0.059	0.785	0.274	0.010
Any presyncope	0.235	0.137	0.273	< 0.001
Presyncope after exercise	0.078	0.712	0.273	0.002
Hypertension (physician reported)	0.078	0.708	0.268	0.002
Warmth before a spell	0.078	0.662	0.232	< 0.001
Any chest pain	0.098	0.543	0.215	< 0.001
Nausea before a spell	0.059	0.722	0.211	0.001
Remembered loss of consciousness	0.118	0.425	0.204	< 0.001
Presyncope with prolonged sitting/standing	0.059	0.676	0.181	< 0.001
Diaphoresis before a spell	0.059	0.653	0.169	< 0.001
Chest pain before a spell	0.020	0.872	0.153	0.025
Palpitations before loss of consciousness	0.039	0.662	0.116	< 0.001
Dyspnea before loss of consciousness	0.020	0.763	0.083	< 0.001
Coronary heart disease	0.020	0.749	0.078	< 0.001
Loss of consciousness with prolonged sitting/standing	0.020	0.603	0.049	< 0.001

The univariate diagnostic behavior of each of the variables is expressed as its sensitivity, specificity and likelihood ratio for seizures. The likelihood ratio is the probability of a seizure patient experiencing the symptom divided by the probability of a syncope patient experiencing the symptom. *One or more of witnessed amnesia for abnormal behavior, witnessed unresponsiveness, unusual posturing or limb jerking. The p value is for the chi-square test for the 2 × 2 table formed by cross-tabulating the presence or absence of the factor with the variable indicating syncope/seizure.

Table 4 Predictors of cardiac cause of syncope on multivariable analysis and point scores for the diagnosis of cardiac syncope

Variable	p Value	OR (95% CI)	Regression coefficient	Score
Palpitations preceding syncope	<0.001	64.8 (8.9 to 469.8)	4.2	4
Heart disease or abnormal ECG, or both	<0.001	11.8 (7.7 to 42.3)	2.9	3
Syncope during effort	<0.001	17.0 (4.1 to 72.2)	2.8	3
Syncope while supine	0.007	7.6 (1.7 to 33.0)	2.0	2
Precipitating or predisposing factors, or both*	0.01	0.3 (0.1 to 0.8)	-1.1	-1
Autonomic prodromes†	0.02	0.4 (0.2 to 0.9)	0.8	-1

*Warm-crowded place/prolonged orthostasis/fear—pain—emotion; †nausea/vomiting.